UM10005_3

ISP1561 Evaluation Board User's Guide

Semiconductors

April 2003

User's Guide

Rev. 2.0

Revision History:

Revision	**Date**	**Description**	**Author**
2.0	Apr 2003	Updated terminology • "USB 1.1" to "Original USB" • "USB 2.0" to "Hi-Speed USB" • "I²C" to "I²C-bus"	Yuk-lin ONG
1.3	Mar 2003	Updated the following sections: • Section 4.7 • Section 6.2 • Section 7	Teh Hock Lye
1.2	Oct 2002	Updated the following sections: • Section 4.4, removed the last paragraph. • Section 8: Changed PSR05 to PSR05-PD10611.	Tan Kim Kiat
1.1	July 2002	Contents update.	Socol Constantin, Adrian Albu and Teh Hock Lye
1.0	Feb 2002	First draft.	Adrian Albu and Socol Constantin

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CONTENTS

FIGURES

1. Introduction

The ISP1561 evaluation board is a standard implementation of the ISP1561 in a complete configuration that allows you to exercise all signals and main features. Figure 1-1 shows the ISP1561 evaluation board.

Some of the features that are implemented in the ISP1561 evaluation board are as follows:

- Selection between PCI V_{AUX} and PCI V_{CC} power supply, with voltage presence indicator. This feature in combination with the auxiliary +5 V input on J1 allows testing the system wake-up from power management states, such as S3cold, in which PCI V_{CC} is not present. This is intended mainly for testing the ISP1561 in motherboard or notebook designs.
- Selection between 12 MHz clock (from a crystal) or 48 MHz clock (from a 48 MHz oscillator) input. By default, 12 MHz crystal is implemented.
- Simple and reliable overcurrent protection scheme that allows testing of the $\overline{OCn}$ and $\overline{PWEn}$ signals. Alternative solutions (resettable circuit protection devices) can be adopted.
- Port power and GoodLink™ LEDs. These may be omitted in a standard commercial implementation but are considered useful on the evaluation board for easier understanding of functionality and debugging.
- Connector for testing legacy signals in the case of an on-board solution design. Testing the legacy feature requires a motherboard with BIOS support for USB or legacy implementation on OHCI.
- Input for an external power supply (J1). This allows complete testing of power management on a standard mainboard, including the power management modes in which the PCI +5 V is cut off.

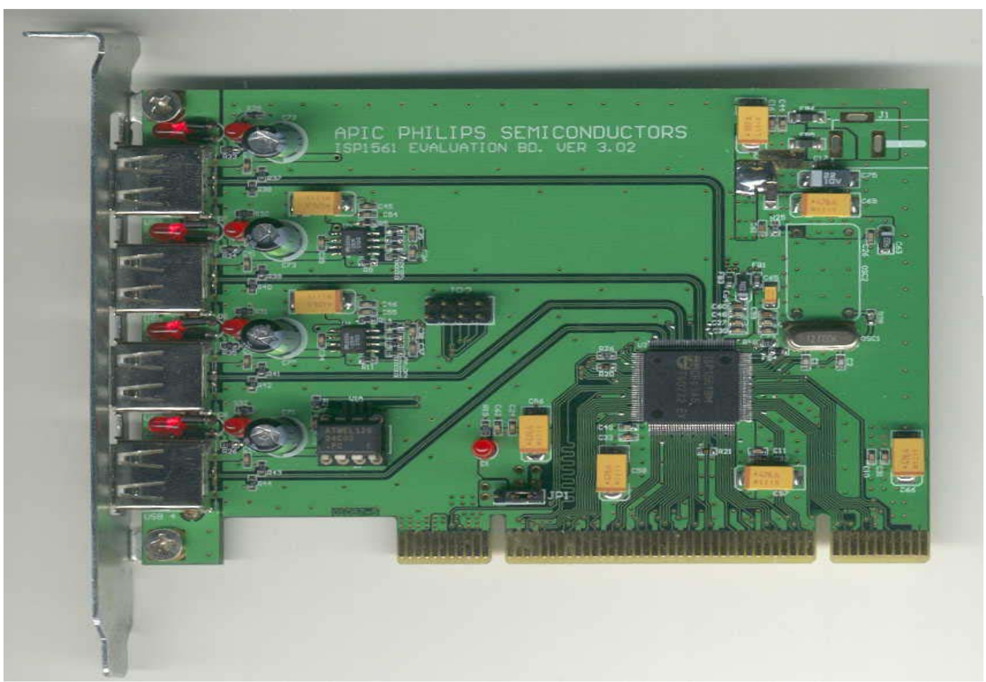


Figure 1-1: ISP1561 Evaluation Board

2. ISP1561 Pin Configuration

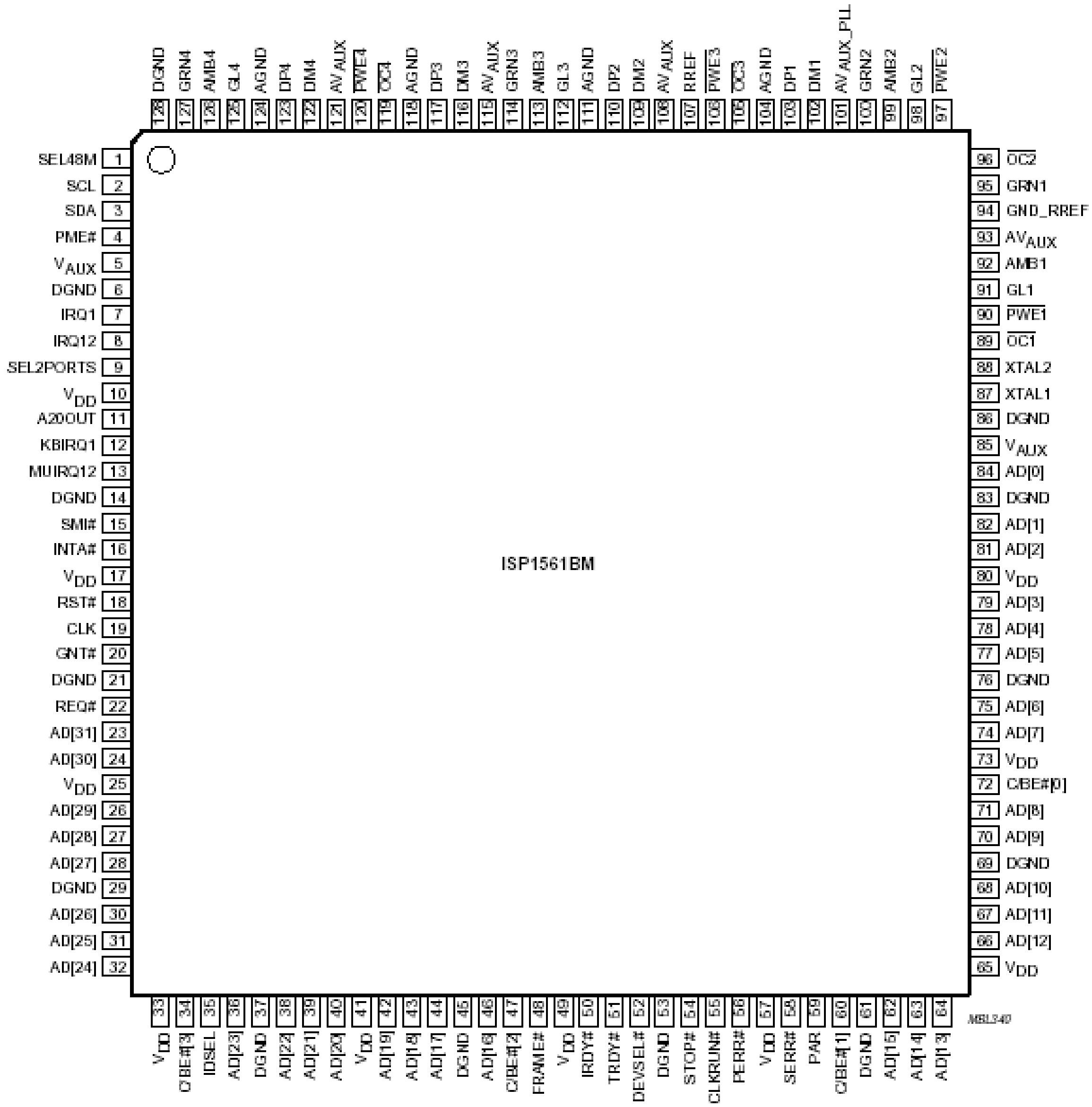


Figure 2-1: Pin Configuration

3. System Requirements

- Intel® PII400 MHz processor and above, or equivalent in speed from AMD®, Cyrix® and VIA®, is recommended.
  Generally, the processor usage indicator will vary according to the type and number of applications launched for exercising USB devices attached. For example, running data transfer tests on two high-speed (HS) hard disk drives (HDDs) on a P4 at 1.7 GHz, 128 Mbytes DDRAM, Microsoft® Windows® 2000 will determine a processor usage figure of 30% to 40%. Adding two Original USB cameras and an application playing MP3 song through Original USB speakers may increase the average processor usage figure up to 70% to 80%. Also, a Hi-Speed USB camera and an Original USB camera running simultaneously will increase the processor usage up to 100% (depending on resolution settings).

- Motherboard with PCI slots that are compatible with *PCI Local Bus Specification, Rev. 2.2* (Supporting at least S1 and S3 power management modes for power management features testing.).
- Memory: Minimum amount as indicated by the operating system and applications requirements, similar to processor speed requirement mentioned earlier. Only a small amount of memory is occupied by the installation of the device drivers itself or OHCI/EHCI functionality.
- HDD space: Mainly determined by the operating system and applications requirements because specific drivers need very little space.
- Graphics cards, other adapter cards: No special requirements.
- Operating systems supported: Windows 98 Second Edition (SE), Windows 2000, Windows XP and Windows Millennium Edition (Me).

4. ISP1561 Evaluation Board

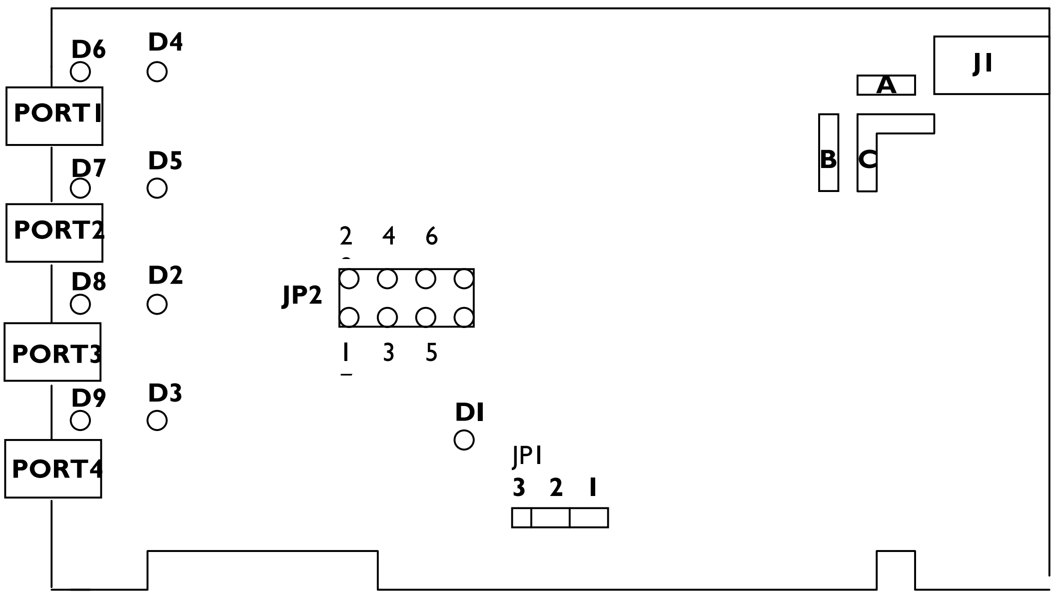


Figure 4-1: Evaluation Board Schematic

4.1. Port Powered LEDs

LEDs D2, D3, D4 and D5 indicate the power status of USB ports. If a port is powered, the respective LED is turned on. It is turned off during system boot-up until OHCI or EHCI drivers are loaded, or it is switched off whenever an overcurrent condition occurs.

4.2. GoodLink LEDs

LEDs D6, D7, D8 and D9 are GoodLink indicators. These LEDs blink when a device is connected to the respective port indicating port activity.

4.3. V_{AUX} Power Supply

If the motherboard used is PCI 2.2 compliant, jumper JP1 position 2-3 may be shorted, allowing S3cold suspend and resume testing (PCI V_{AUX} = 3.3 V is used and an external +5 V is necessary). If the motherboard used is PCI 2.1 or older version compliant, jumper JP1 position 1-2 must be shorted (PCI V_{CC} = 3.3 V is used because V_{AUX} is not present). Note that in both these situations LED D1 must be turned on indicating that the ISP1561 is powered.

Important: If the LED D1 is not lit, it indicates that the ISP1561 does not have the V_{AUX} supply (V_{AUX} is not supplied in the PCI connector). Therefore, your computer will stop responding or 'hang' when the operating system is loading OHCI or EHCI drivers. Switch JP1 to position 1-2 to connect to the PCI V_{CC} = 3.3 V (present under normal conditions, except some system power management modes, for example, S3cold and S4).

4.4. Legacy Support

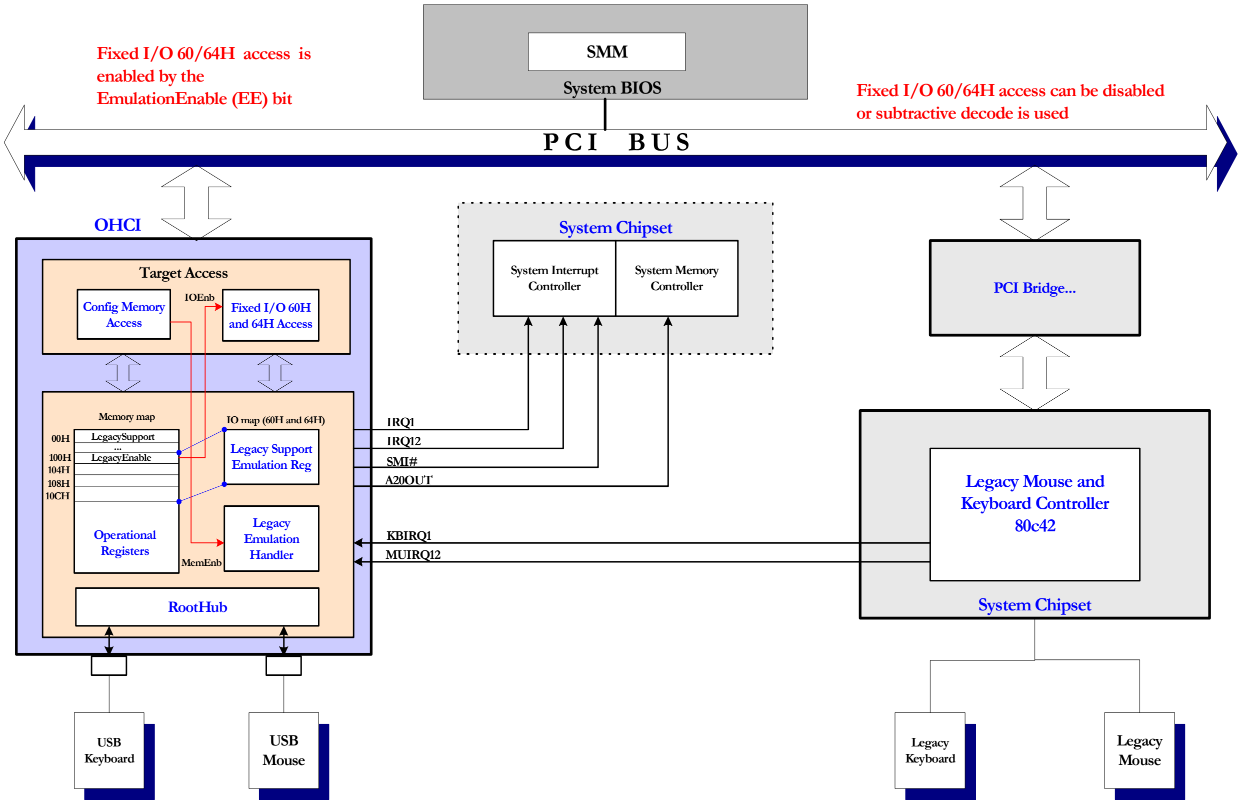


Figure 4-2: Block Diagram of Legacy Signal Connection and Testing

Figure 4-2 shows the necessary connections for testing the legacy support functionality. The necessary signals must be accessible on the motherboard used for legacy testing.

Testing	**R22**	**R23**	**R2**	**R3**
Legacy support	—[1]	—[1]	10 kΩ	10 kΩ
Default setting (No legacy support)	0 Ω	0 Ω	10 kΩ	10 kΩ

[1] When testing the legacy support, resistors R22 and R23 (or the pull-down resistors located at the bottom of the evaluation board) must be removed.

The JP2 connector is used for testing the keyboard and mouse legacy support.

Pin Number	Signal
1	GND
2	GND
3	A20OUT
4	SMI#
5	KBIRQ1
6	IRQ12
7	MUIRQ12
8	IRQ1

4.5. Input Clock

You can use either the 12 MHz crystal or the 48 MHz oscillator for the input clock. If the 12 MHz crystal is used, both the resistors (R1 and R27) are soldered. If the 48 MHz oscillator is used, resistor R27 (0 Ω) must be removed and pin 1 is pulled HIGH by R1. By default, the 12 MHz solution is implemented on the evaluation board.

4.6. External 5 V Power Source and S3 Wake-Up Capability

The jack J1 is used for connection of an external +5 V standby power supply to test the system wake-up from S3cold and maintain the connected USB devices powered so that re-enumeration is avoided.

When the system is in the S3cold Power Management State, the +5 V main power at PCI connectors disappears. Therefore, all downstream ports will not be powered because V_{BUS} is derived from the PCI +5 V power supply. In this situation, downstream bus-powered devices, such as mouse and keyboard, are not functional and cannot wake up the system.

If you want to use the external +5 V supply, pads A and C on the evaluation board must be soldered together as represented in the evaluation board drawing. Similarly, if you only intend to use PCI +5 V as the V_{BUS} power source (no testing of the system wake-up from S3cold and no external +5 V connected), then pads B and C must be soldered together. Pads A, B and C are copper areas on the upper-right corner of the evaluation board (see Figure 4-1). This solution, using three copper pads, was adopted to avoid using a jumper because only the default configuration (pads B and C connected together) will be used most of the time.

4.7. Loading the Subsystem ID and Vendor ID from the External EEPROM

Expansion board vendors can use the Subsystem Vendor ID and the Subsystem ID for identification of the board and loading of the correct drivers by the operating system. The PCI SIG assigns the Subsystem Vendor ID and the vendor determines the Subsystem ID.

The Subsystem Vendor ID and the Subsystem ID can be optionally loaded at power-on from the external serial I^2C-bus® EEPROM present on the ISP1561 evaluation board. A 3.3 V serial EEPROM of any size can be used because only a few locations will be used for data loading.

The serial I^2C-bus EEPROM present on the ISP1561 evaluation board cannot be programmed onboard. It should be preprogrammed by using a standard serial EEPROM programmer. A socket is provided on the ISP1561 evaluation board for repetitive reprogramming of the EEPROM.

An example on the I^2C-bus EEPROM programming is given in Figure 4-3. In the example, it is assumed that the Subsystem Vendor ID is 1132H, the Subsystem Device ID for OHCI is 1664H, and the Subsystem Device ID for EHCI is 1665H.

Address	I^2C-Bus EEPROM Content	
0	32H	Subsystem Vendor ID—LOW
1	11H	Subsystem Vendor ID—HIGH
2	64H	Subsystem Device ID (OHCI)—LOW
3	16H	Subsystem Device ID (OHCI)—HIGH
4	65H	Subsystem Device ID (EHCI)—LOW
5	16H	Subsystem Device ID (EHCI)—HIGH
6	FFH	reserved
7	15H[1]	reserved

[1] Loads Subsystem Vendor ID and Device ID. For more details, refer to the *ISP1561 Hi-Speed USB PCI host controller* datasheet.

Figure 4-3: I^2C-bus EEPROM Programming Example

Note: Do not load any other values in reserved fields, otherwise, functionality of the ISP1561 is not guaranteed.

5. Hi-Speed USB (EHCI) Drivers

For Windows 2000 and Windows XP, the standard Microsoft EHCI drivers can be used. The best way to obtain the latest EHCI drivers is to download from the Microsoft web site. Installation or update of EHCI device drivers for the supported operating systems follows the standard installation procedure for device drivers, and so should not present any difficulty.

However, the usb2.inf file must be modified to match the Philips Vendor ID (VID), Device ID (DID) and IC revision code.

If there are difficulties in loading the Hi-Speed USB (EHCI) drivers, particularly for Windows 2000 and Windows XP, the first step is to check the correctness of the VID, DID and REV_ID specified in the INF file. These values must match with the values implemented in the respective revision of the ISP1561 found on the evaluation board.

An example of the necessary modifications that must be made to a usb2.inf file is as follows. The file example contains information regarding the ISP1561 VID, DID and REV_ID. These modifications are similar for Windows 2000 and Windows XP.

1. Add the following line of code under the **[Manufacturer]** section:

```
%Philips%=Philips
```

2. Under the **USB 2.0 Hub Support** section, add the following lines of code:

```
; ================== Philips ================================
[Philips]
; for Windows 2000
%PCI\VEN_1131&DEV_1562&REV_30.DeviceDesc%=EHCI,PCI\VEN_1131&DEV_1562&REV_30
%USB\ROOT_HUB20.DeviceDesc%=ROOTHUB2,USB\ROOT_HUB20
; HUBs
%USB\HubClass.DeviceDesc%=Usb2Hub.Dev,USB\HubClass
```

3. Add the following lines of code under the **[Strings]** section:

```
Philips="Philips"
PCI\VEN_1131&DEV_1562&REV_30.DeviceDesc="PHILIPS PCI to USB Enhanced Host Controller ES5"
```

For Windows 98 and Windows Me, Philips provides EHCI device drivers; no modification in its INF file is required.

Windows 98, Windows Me, Windows 2000 and Windows XP supply the device drivers for OHCI by default.

6. Loading of the ISP1561 Drivers

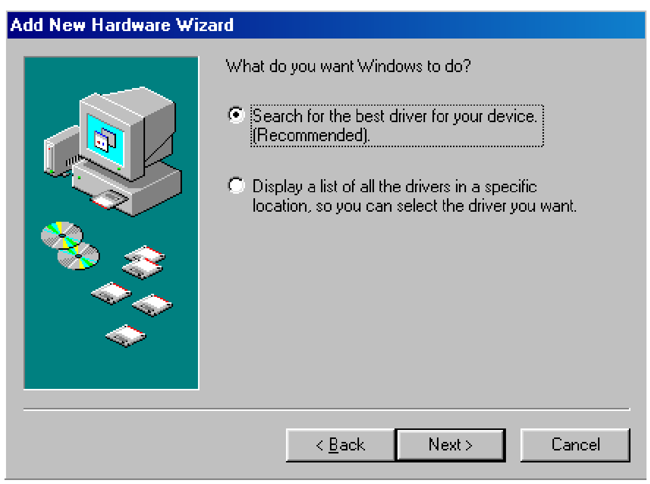
This section provides an example on loading device drivers after an ISP1561 add-on card is plugged into a computer running Windows 98. Loading of OHCI drivers (supplied by the operating system) and Hi-Speed USB (EHCI) drivers provided by Philips is shown in a step-by-step process.

Note: In the case of Windows 2000 and Windows XP, OHCI drivers are automatically installed by the operating system without any user intervention.

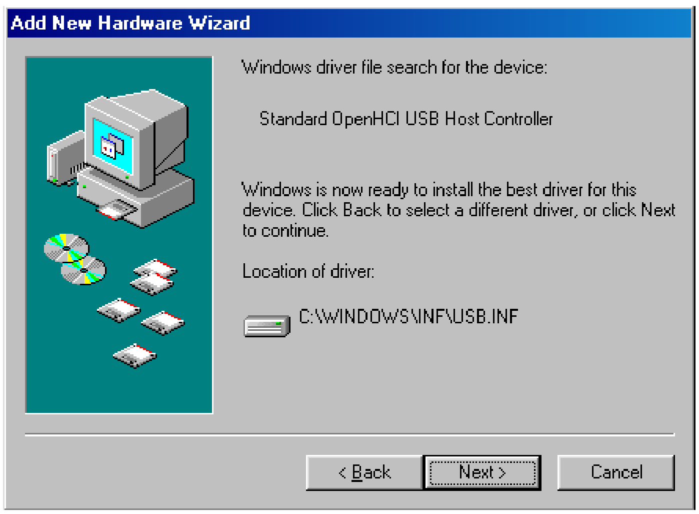
6.1. Loading of OHCI Drivers

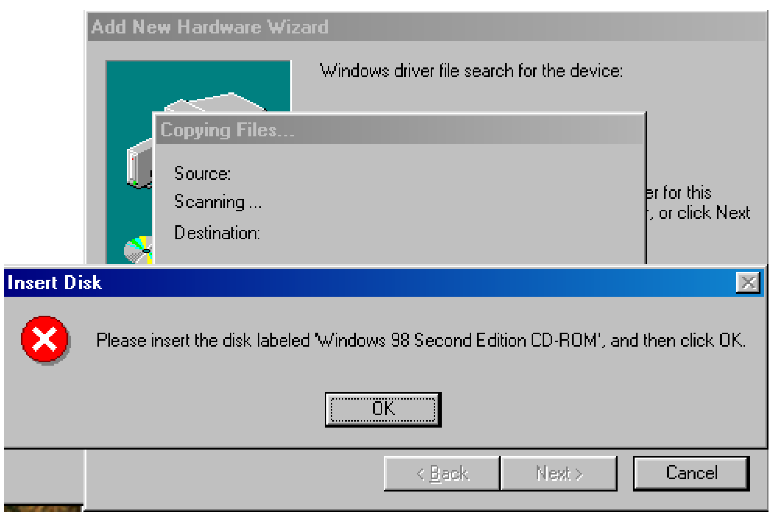
The following wizard appears when an ISP1561 add-in card is plugged on a computer running Windows 98, enabling you to install OHCI drivers.

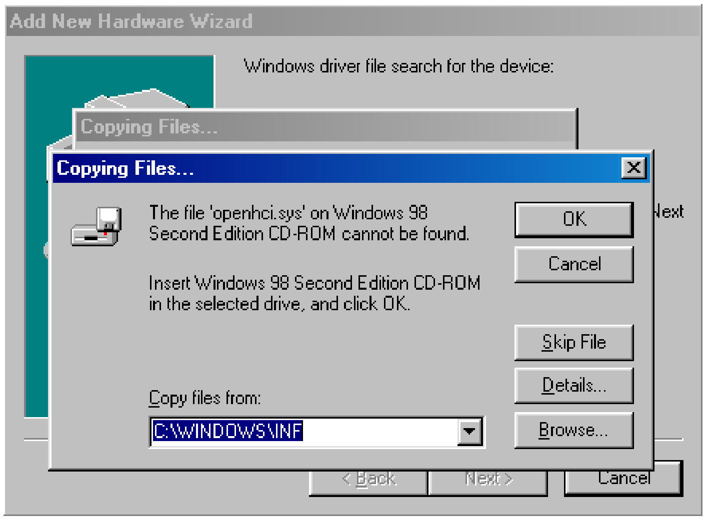




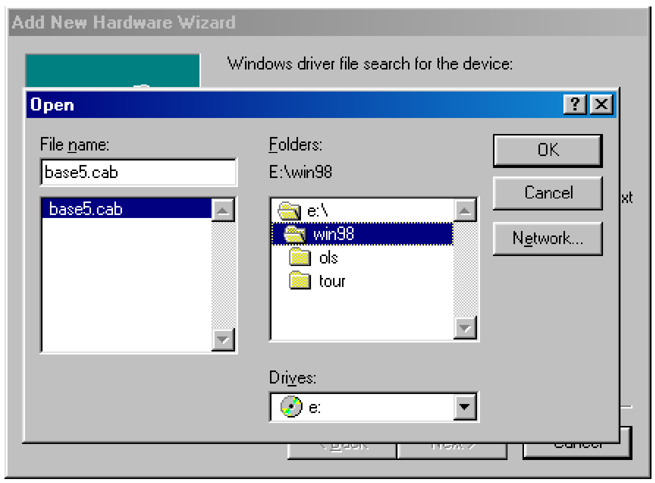

Add New Hardware Wizard
Windows will search for new drivers in its driver database on your hard drive, and in any of the following selected locations. Click Next to start the search.
Floppy disk drives
CD-ROM drive
Microsoft Windows Update
Specify a location:
E:
Browse...
< Back
Next >
Cancel

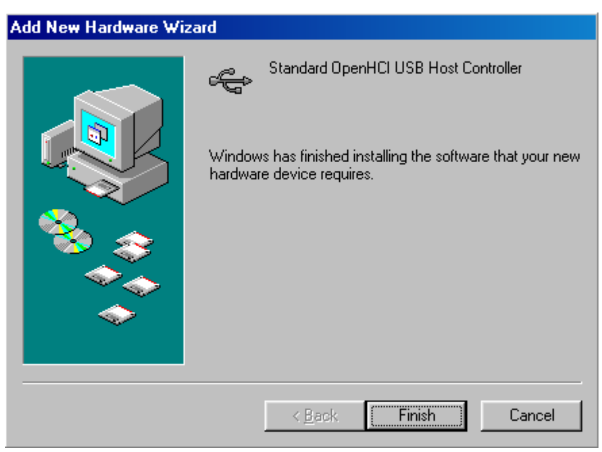

Add New Hardware Wizard
Windows driver file search for the device:
Standard OpenHCI USB Host Controller
Windows is now ready to install the best driver for this device. Click Back to select a different driver, or click Next to continue.
Location of driver:
C:\WINDOWS\INF\USB.INF
< Back
Next >
Cancel


Add New Hardware Wizard
Windows driver file search for the device:
Copying Files...
Source:
Scanning ...
Destination:
Insert Disk
Please insert the disk labeled 'Windows 98 Second Edition CD-ROM', and then click OK.
OK
< Back
Next >
Cancel



Click the **Browse** button and locate the path where the Windows 98 kit is installed.





Note: The preceding steps will be repeated twice for loading of the drivers for the two OHCI (OHCI1 and OHCI2).

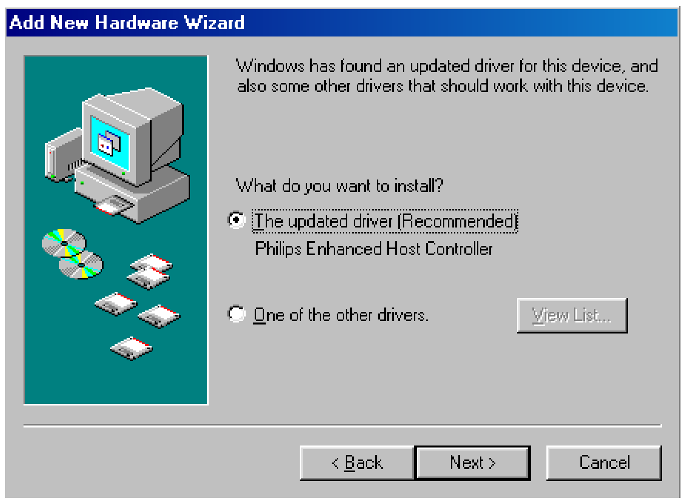
6.2. Loading of EHCI Drivers

After the drivers have been loaded for OHCI1 and OHCI2, the following wizard appears, when an ISP1561 add-on card is plugged on to a computer running Windows 98, enabling you to install the Hi-Speed USB EHCI drivers.





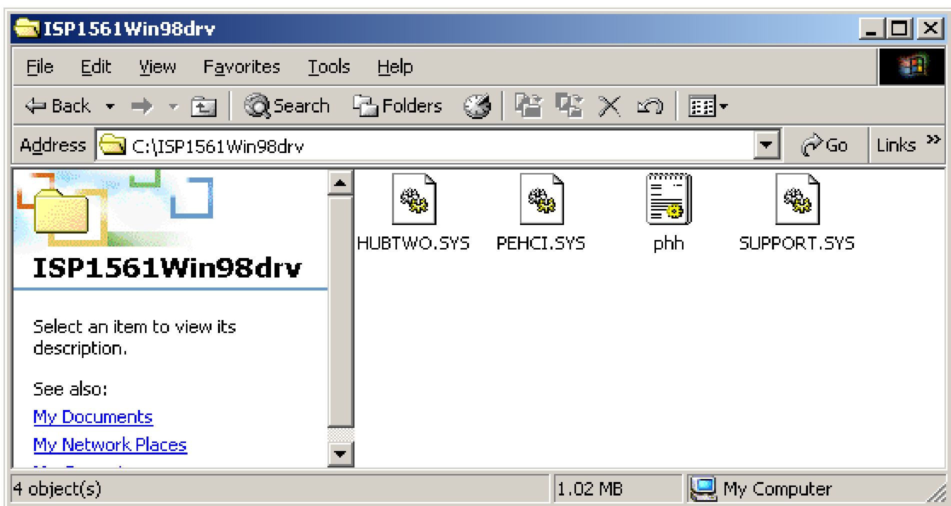

Add New Hardware Wizard
Windows will search for new drivers in its driver database on your hard drive, and in any of the following selected locations. Click Next to start the search.
Floppy disk drives
CD-ROM drive
Microsoft Windows Update
Specify a location:
d:\1561win98drv
Browse...
< Back
Next >
Cancel


Add New Hardware Wizard
Windows has found an updated driver for this device, and also some other drivers that should work with this device.
What do you want to install?
The updated driver (Recommended)
Philips Enhanced Host Controller
One of the other drivers.
View List...
< Back
Next >
Cancel

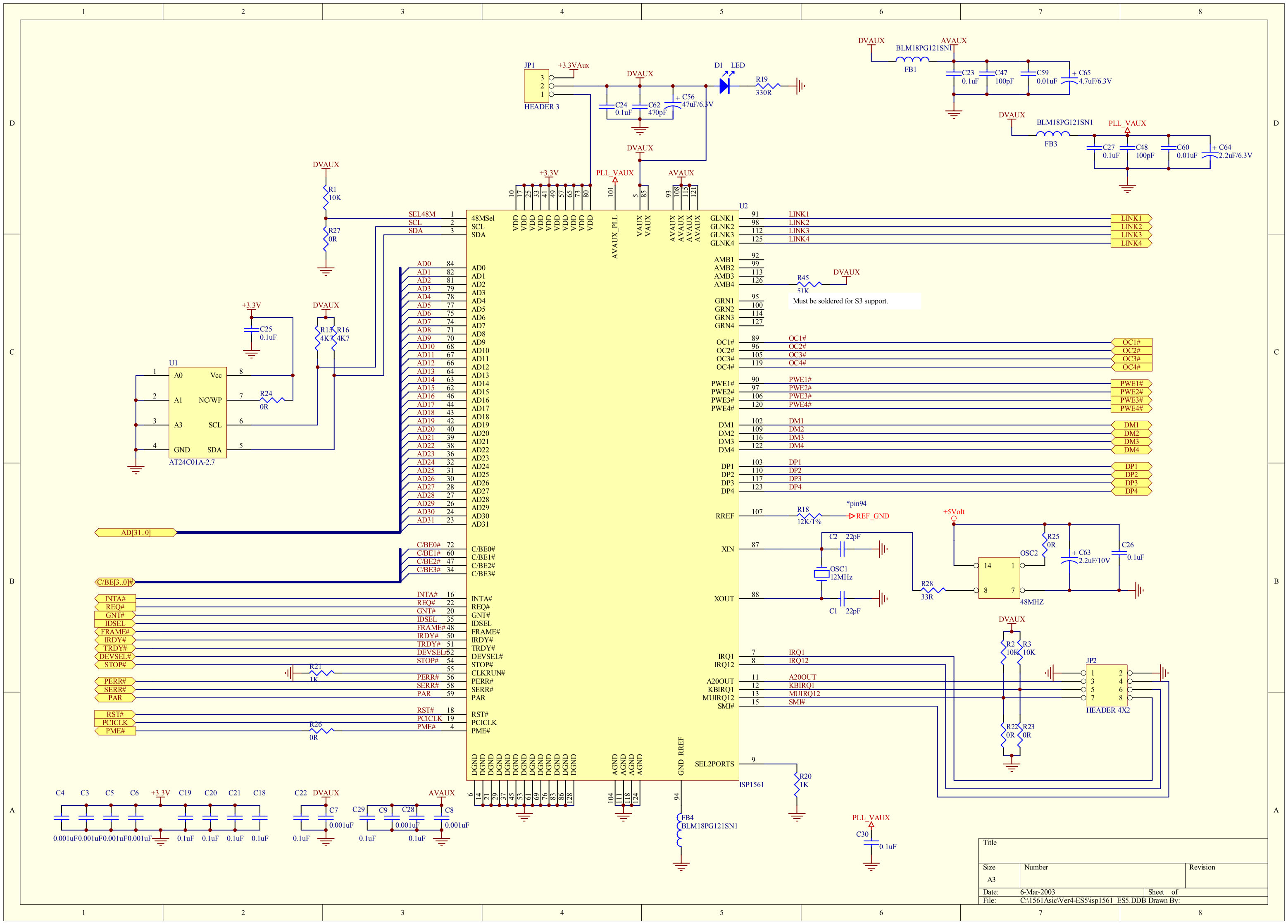

Add New Hardware Wizard
Windows driver file search for the device:
Philips Enhanced Host Controller
Windows is now ready to install the best driver for this device. Click Back to select a different driver, or click Next to continue.
Location of driver:
D:\1561WI~1\PHH.INF
< Back
Next >
Cancel



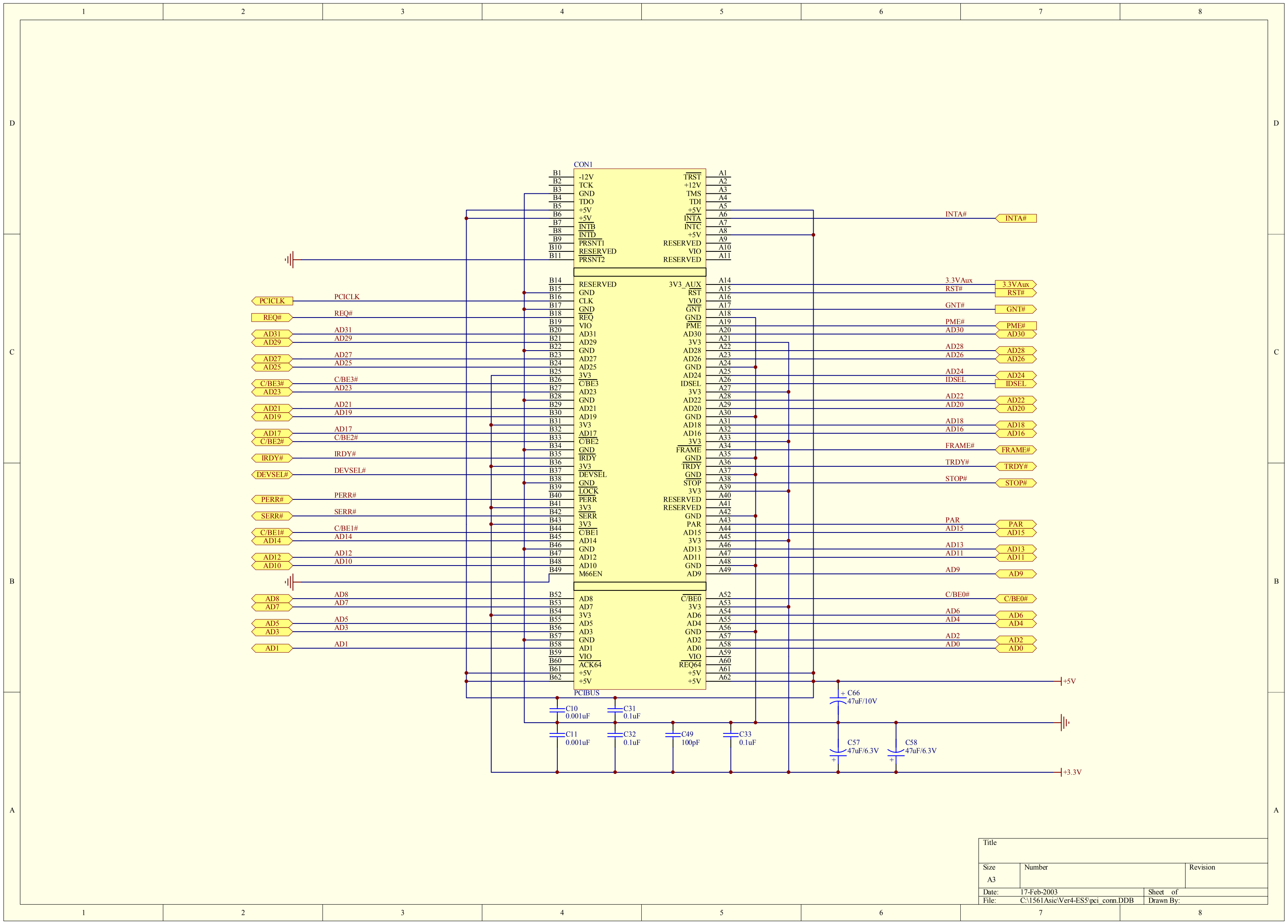
For your reference, the contents of the Windows 98/Windows Me EHCI driver are as follows:

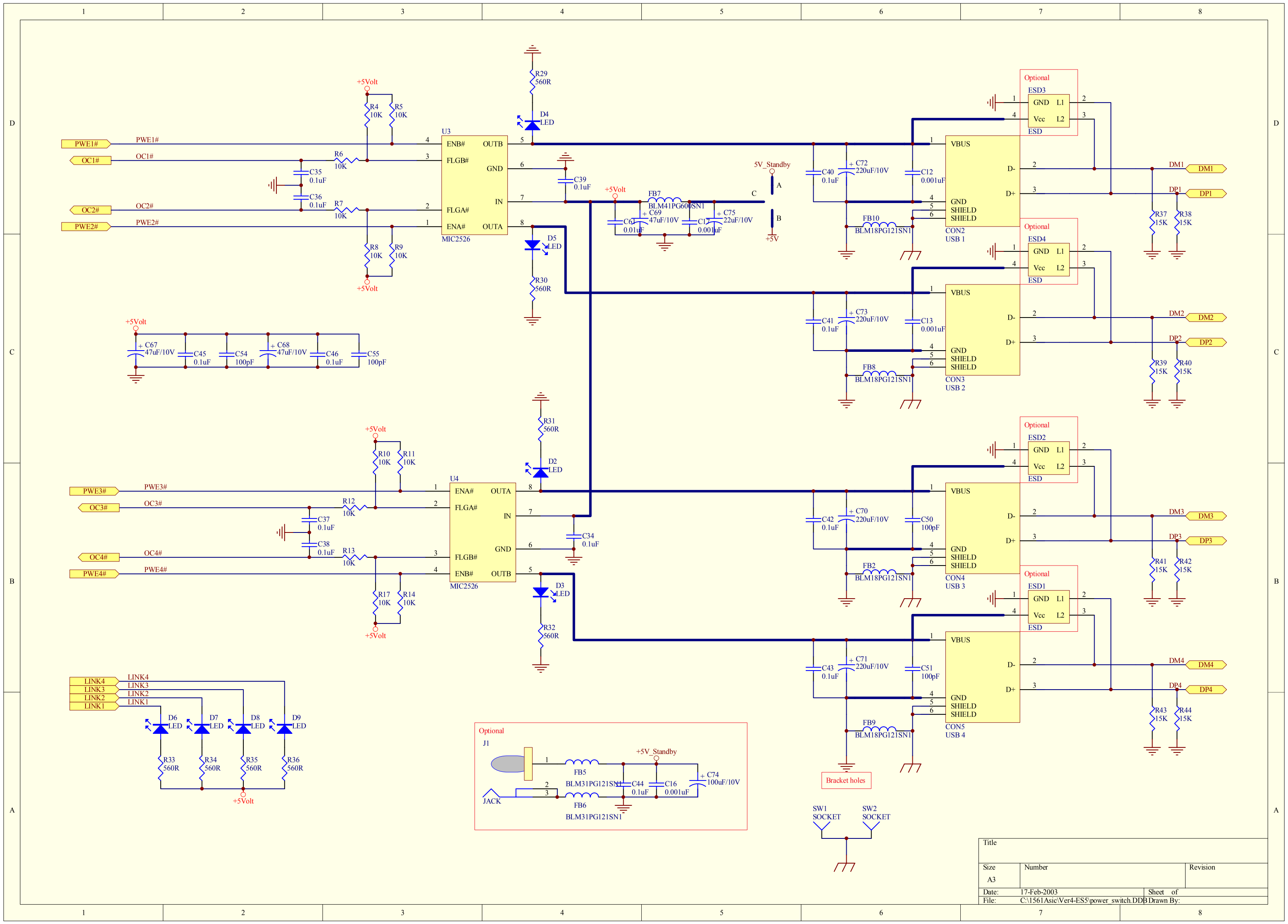


7. Schematics



JP1
HEADER 3
+3.3VAux
DVAUX
D1 LED
R19 330R
C24 0.1uF
C62 470pF
C56 47uF/6.3V
FB1 BLM18PG121SN1
AVAUX
C23 0.1uF
C47 100pF
C59 0.01uF
C65 4.7uF/6.3V
FB3 BLM18PG121SN1
PLL_VAUX
C27 0.1uF
C48 100pF
C60 0.01uF
C64 2.2uF/6.3V
R1 10K
R27 0R
+3.3V
C25 0.1uF
R15 4K7
R16 4K7
R24 0R
U1
AT24C01A-2.7
A0 A1 A3 GND Vcc NC/WP SCL SDA
U2
ISP1561
SEL48M SCL SDA
AD[31..0]
C/BE[3..0]#
INTA# REQ# GNT# IDSEL FRAME# IRDY# TRDY# DEVSEL# STOP# CLKRUN# PERR# SERR# PAR RST# PCICLK PME#
R21 1K
R26 0R
LINK1 LINK2 LINK3 LINK4
AMB1 AMB2 AMB3 AMB4
GRN1 GRN2 GRN3 GRN4
R45 51K
Must be soldered for S3 support.
OC1# OC2# OC3# OC4#
PWE1# PWE2# PWE3# PWE4#
DM1 DM2 DM3 DM4
DP1 DP2 DP3 DP4
RREF
R18 12K/1%
*pin94
REF_GND
XIN XOUT
C2 22pF
C1 22pF
OSC1 12MHz
R28 33R
+5Volt
R25 0R
OSC2 48MHZ
C63 2.2uF/10V
C26 0.1uF
IRQ1 IRQ12 A20OUT KBIRQ1 MUIRQ12 SMI#
R2 10K
R3 10K
R22 0R
R23 0R
JP2
HEADER 4X2
SEL2PORTS
R20 1K
GND_REEF
FB4 BLM18PG121SN1
C30 0.1uF
C4 C3 C5 C6 0.001uF
C19 C20 C21 C18 0.1uF
C22 0.1uF
C7 0.001uF
C29 C9 0.1uF
C28 0.001uF
C8 0.001uF
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Number
Revision
Date: 6-Mar-2003
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Drawn By:


CON1
PCIBUS
INTA#
3.3VAux
RST#
GNT#
PME#
AD30
AD28
AD26
AD24
IDSEL
AD22
AD20
AD18
AD16
FRAME#
TRDY#
STOP#
PAR
AD15
AD13
AD11
AD9
C/BE0#
AD6
AD4
AD2
AD0
PCICLK
REQ#
AD31
AD29
AD27
AD25
C/BE3#
AD23
AD21
AD19
AD17
C/BE2#
IRDY#
DEVSEL#
PERR#
SERR#
C/BE1#
AD14
AD12
AD10
AD8
AD7
AD5
AD3
AD1
C10 0.001uF
C11 0.001uF
C31 0.1uF
C32 0.1uF
C49 100pF
C33 0.1uF
C66 47uF/10V
C57 47uF/6.3V
C58 47uF/6.3V
+5V
+3.3V
Title
Size A3
Number
Revision
Date: 17-Feb-2003
Sheet of
File: C:\1561Asic\Ver4-ES5\pci_conn.DDB
Drawn By:


U3
MIC2526
U4
MIC2526
PWE1#
OC1#
OC2#
PWE2#
PWE3#
OC3#
OC4#
PWE4#
LINK4
LINK3
LINK2
LINK1
+5Volt
5V_Standby
+5V
CON2
USB 1
CON3
USB 2
CON4
USB 3
CON5
USB 4
Optional
ESD1
ESD2
ESD3
ESD4
DM1
DP1
DM2
DP2
DM3
DP3
DM4
DP4
J1
JACK
Bracket holes
SW1
SOCKET
SW2
SOCKET
Title
Size
A3
Number
Revision
Date: 17-Feb-2003
Sheet of
File: C:\1561Asic\Ver4-ES5\power_switch.DDB
Drawn By:

8. Bill of Materials

The following table provides the bill of materials for the ISP1561 evaluation board.

Quantity	Part Type	Designator	Footprint	Description
2	—	JP3 JP4	RADO.2	—
13	0.001 µF	C3 C4 C5 C6 C7 C8 C9 C10 C11 C12 C13 C16 C17	0603	—
3	0.01 µF	C59 C60 C61	0603	—
29	0.1 µF	C18 C19 C20 C21 C22 C23 C24 C25 C26 C27 C28 C29 C30 C31 C32 C33 C34 C35 C36 C37 C38 C39 C40 C41 C42 C43 C44 C45 C46	0603	—
6	0 Ω	R22 R23 R24 R25 R26 R27	0603	—
7	100 pF	C47 C48 C49 C50 C51 C54 C55	0603	—
1	100 µF/10 V	C74	REC1/2	—
14	10 kΩ	R1 R2 R3 R4 R5 R6 R7 R8 R9 R10 R11 R12 R13 R14	0603	—
1	12 kΩ ±1%	R18	0603	—
1	12 MHz	OSC1	XTAL1	30 ppm
8	15 kΩ	R37 R38 R39 R40 R41 R42 R43 R44	0603	—
2	1 kΩ	R20 R21	0603	—
1	2.2 µF /10 V	C63	—	—
1	2.2 µF /6.3 V	C64	—	—
4	220 µF/10 V	C70 C71 C72 C73	REC1/2	—
2	22 pF	C1 C2	0603	—
1	22 µF/10 V	C75	REC1/2	—
1	330 Ω	R19	0603	—
1	33 Ω	R28	—	—
1	4.7 µF/6.3 V	C65	—	—
1	470 pF	C62	0603	—
4	47 µF/10 V	C66 C67 C68 C69	CASE-D	—
3	47 µF /6.3 V	C56 C57 C58	CASE-D	—
1	48 MHz	OSC2	XTAL3	30 to 50 ppm, optional
3	4 kΩ	R15 R16 R17	0603	—
8	560 Ω	R29 R30 R31 R32 R33 R34 R35 R36	0603	optional
1	51 kΩ	R45	0603	optional
1	AT24C01A-2.7	U1	—	Atmel I^2C-bus EEPROM; optional
7	BLM18PG121SN1	FB1 FB2 FB3 FB4 FB8 FB9 FB10	—	Murata
2	BLM31PG121SN1	FB5 FB6	1206	Murata; optional
1	BLM41PG600SN1	FB7	1206Cust	Murata; optional
4	ESD	ESD1 ESD2 ESD3 ESD4	—	PSR05-PD10611-Protek devices; optional
1	HEADER 3	JP1	SIP3	Optional
1	HEADER 4X2	JP2	—	Optional
1	ISP1561	U2	—	Philips
1	JACK	J1	—	PCB mount socket pin diameter 2.5; optional
9	LED	D1 D2 D3 D4 D5 D6 D7 D8 D9	LED3	Optional

Quantity	Part Type	Designator	Footprint	Description
2	MIC2526	U3 U4	SO-8	Micrel
1	USB 1	CON2	USB-TYPEA	—
1	USB 2	CON3	USB-TYPEA	—
1	USB 3	CON4	USB-TYPEA	—
1	USB 4	CON5	USB-TYPEA	—

9. References

- *ISP1561 Hi-Speed USB PCI host controller* datasheet
- *Designing a USB 2.0 Host PCI Adapter Using ISP1561* application note
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- *Universal Serial Bus Specification Rev. 1.1*
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- *PCI Local Bus Specification, Rev. 2.2*
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- *PCI System Architecture, Fourth Edition from MindShare.*

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